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Exports, Sunk Costs and Financial Restrictions in Argentina during the 1990s

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Abstract

This paper examines firms' export decisions in Argentina during the 1990s. Using a sample of 1600 Argentine industrial firms with information for the years 1992, 1996, 1998 and 2001, we test which factors affect the probability of entering foreign markets. We focus on the role of sunk costs and the access to financial markets as key determinants of firms' export decisions. The estimation of a non-linear binary variable model using export prior experience and *explicit* sunk costs variables confirms self-selection hypothesis on export markets participation. Results also suggest that firm-specific characteristics are significant to explain export decisions, particularly firm's access to the financial system.

Keywords: Sunk Costs, Firm's Export Decisions, Financial Restrictions, Argentina.
JEL Classification: C35, F14, O54

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1 Introduction

During the nineties, Argentina implemented major macro-economic reforms which generated dramatic changes in its economic structure, both at a macro and microeconomic level. Some economic policies, the trade and current account liberalisation and the establishment of a currency board, had significant consequences on the country's specialisation pattern. The intensification of market competition and unfavourable relative prices—strong currency appreciation—reduced the profitability of the tradable sector and penalised exports, particularly of manufacturing goods.

Considering this macro-economic context in which the manufacturing sector was severely constrained, this paper investigates the factors that determine the ability of manufacturing firms to enter foreign markets. In this respect, our purpose is to asses the impact of sunk start-up costs and firm-specific characteristics (particularly, access to financial markets) on industrial firms' export behaviour in Argentina during the 1990.

Following the empirical literature on the topic (Aw & Hwang 1995, Roberts & Tybout 1997, Clerides, Lach & Tybout 1998, Bernard & Wagner 1998, Bernard & Jensen 2004, Girma, Greenaway & Kneller 2004), we estimate an export equation using non-linear discrete regression models, where sunk costs are measured by firms' export experience — i.e. whether the firm have exported in the previous period. Our aim is then to shed some light on this empirical strategy, by including a set of variables that *explicitly* represents a cost that a firm must incur to participate in foreign markets: improve the skill of firm's labour force in order to export, carry out innovation activities in order to export, and implement environment-friendly policies requested by foreign markets.

Our empirical work uses a firm-level database including more than 1600 Argentinean manufacturing firms for the years 1992, 1996, 1998 and 2001, extracted from the two National Survey of the Technological Behaviour of Argentine Industrial Firms. We argue that although traditional factors like size, age or productivity might be relevant to explain firms' export decisions, their access to financial markets is likely to constrain or allow export activity. To our knowledge, the novelty of this paper is that it includes both finance related variables and *explicit* sunk cost variables in an empirical export decision model at a firm-level.[1] Besides, there are no systematic analysis of export decisions for Argentine firms after the fully trade liberalisation of the nineties.

The remainder of the paper is organised as follows. The next section summarises the theoretical framework and section 3 presents the econometric model and discusses some methodological issues. Section 4 describes the database and provides some descriptive statistics. In section 5 we examine estimations' outcomes, and we conclude in section 6.

[1] Given that the literature cited in the following section deals empirically with this issue at macro-economic or industrial level.

2 Theoretical background

We follow two branches of the trade literature: one that links productivity and trade, and the other that studies the impact of financial development on trade.

Concerning the first branch, in the last two decades, many economic researchers turn their attention to the causality relation between firms' productivity performance and firms' capacity to export.[2] Some authors argue that there is a self-selection mechanism by which only the more productive firms can afford the sunk start-up costs a firm must incur to export. Thus, the more productive the firm is, the higher the probability to enter foreign market is expected to be.[3] By contrast, an alternative view is that exporting firms enhance their productivity performance while selling to foreign markets, in a kind of *learning-by-exporting* phenomenon (suggesting the presence of scale economies or learning process—i.e increasing returns).

In line with the first view, we will study the factors that increase the probability of entering the foreign market and we will particularly test the role of prior experience in present firm's export capacity. The underlying assumption is that firms have to pay an entry cost to enter foreign markets, like the creation of a widespread distribution network or the improvement of product quality, among others. These intuitions follows the theoretical models put forward by the so-called hysteresis literature (Baldwin & Krugman 1989, Dixit 1989, Krugman 1989). They define *sunk* costs as the expenditures that non-exporters must incur in order to enter foreign markets, and which salient feature is their irreversibility. As the authors point out, this assumption implies that transitory policies or situations (for instance, a currency appreciation) can have permanent consequences on the economy, a phenomenon known as hysteresis. Furthermore, in an uncertain context, this impact can be even larger since a firm will follow a "wait and see" strategy, rather than undertake those costs to export without having a clue about the exchange rate in the following periods (Krugman 1989, p. 47). As a corollary, the presence of sunk costs in a volatile environment —particularly characterised by a large currency appreciation, like Argentina during the nineties—is more likely to prompt a rather conservative firm behaviour (i.e."wait and see") than an aggressive foreign market penetration.[4]

[2]For a survey of micro evidence on the link between trade and firm performance (productivity, profitability, size), see Tybout (2003).

[3]An important assumption of this self-selection mechanism is heterogeneity among firms. Melitz (2003) proves how under the presence of sunk costs and firm heterogeneity, more productive firms enter foreign markets and gain shares of markets while less productive firms exit the markets, giving rise to an intra-industry re-allocation of resources rather than an inter-industry one. As a result, through this intra-industry allocation channel, trade enhances *aggregate* productivity performance.

[4]As Roberts & Tybout (1997, p. 560) summarise "the combination of sunk cost and uncertainty about future market conditions can create an option value to waiting". Interestingly, those authors find

Following the second branch aforementioned, our empirical work is based on a flourishing literature that links financial development with economic growth and international trade. Seminal works can be found in King & Levine (1993), who explicitly follow old Schumpeterian ideas, as well as in Rajan & Zingales (1998)'s article. As suggested by Rajan & Zingales (1998), and empirically revisited by Beck (2003), the access to financial markets can be thought as a comparative advantage in industries that rely more on external finance. This definition refers to sectors that are technologically highly dependent on external funds because they are either capital intensive branches or very innovative and competitive sectors. Besides, Rajan & Zingales (1998, p. 579) find that widespread financial services have a significant effect on the *quantity* of establishments, more than on the size of existing producers. Therefore, financial development would have a rather extensive effect: on the quantity of new firms producing on the one side, and on their capacity of boosting new products, new processes and/or new markets, in a somewhat Schumpeterian vein.[5]

In the same line, Fanelli & Keifman (2002, p. 3) underline that for countries with a weak financial system one could expect export activity to be highly concentrated in big and well established companies. As it is the case in Argentina (cf. table 1), they point out that the access to financial markets, besides firms' size and age, is a relevant factor determining firms' export ability and, therefore, they conclude that having a well developed financial system can be thought of as a key element of a country non-price competitiveness.

Indeed, exporters must incur important costs to enter foreign markets, and therefore countries with a well developed financial system will enjoy some comparative advantage for export activities.[6] As pointed out by Rajan & Zingales (1998) but at the domestic level, the extensive margin effect dominates in foreign markets as well: aggregate trade flows are more sensitive to the number of exporting firms than to the volume exported by each firm (Chaney 2005, p. 5)

Likewise, Beck (2002) develops a theoretical model that underlines the role of increasing returns to explain why finance matters for export capacity and can determine

some evidence of an *asymmetric* impact of exchange rate on the quantity of firms exporting: the response is stronger during the phase of currency appreciation than during the currency depreciation. A similar outcome is presented in a theoretical model by Amable, Henry, Lordon & Topol (1995), where firms' heterogeneity provokes a strong exchange-rate hysteresis phenomenon.

[5] In Schumpeter's words: "Emphasis upon the significance of credit is to be found in every textbook. That the structure of modern industry could not have been erected without it [...] even the most conservative orthodoxy of the theorists cannot well deny. Nor the connection established here between credit and the carrying out of innovations [...] For it is as clear *a priori* as it is established historically that credit is primarily necessary to new combinations [of productive means]" (Schumpeter 1961, p. 70).

[6] Becker & Greenberg (2005) propose a particular channel to link access to the financial system with international trade, through the role that some particular type of investment has on firms' export capacity—R&D expenditures, product differentiation and innovation on patents, among others.

countries' trade balance. The basic intuition is as follows. In a two sector economy, one with constant and the other with increasing return to scale (food and industry, respectively), where investment in physical assets is financed by external funds (debt), the better the access to financial markets the higher the amount of resources will be allocated in the increasing return sector. His main conclusion is that financial development will enhance capital investment in sectors with higher scale economies, commonly assumed to be manufactured production, and thus "economies with a better-developed financial sector therefore have a comparative advantage in sectors with high scale economies [manufactured goods] and, all else equal, are net exporters of them" (Beck 2002, p. 129).[7]

3 Empirical Model and Econometric Issues

3.1 The Export Decision Model with Sunk Costs

At any moment in time t, and under the hypothesis of sunk costs, a firm i gets a total profit (Π_{it}^T) if it decides to enter foreign markets:

$$\Pi_{it}^T = \Pi_{it}^D + \Pi_{it}^X = p_t^d \, Q_{it}^D + p_t^x \, Q_{it}^X - C_{it} - C_i^X \tag{1}$$

where $i = 1...K$ are the firms, $t = 1...T$ are the time periods; Π_{it}^D is the profit from selling in domestic market; Π_{it}^X is the profit from selling in foreign market; p_t^d are domestic market prices; Q_{it}^D is the quantity of production sold in the domestic market; p_t^x are export prices; Q_{it}^X is the quantity of production exported; C_{it} are total costs of producing Q^D and Q^X; and C_i^X are the costs of entereing foreign markets at any time.[8]

These entry costs are by nature paid once and for all, and can thus be expressed at any moment like: $C_i^X = (1 - X_{t-1}) \, C_i^X$, where X_{t-1} is equal to 1 if the firm exported in the previous period, and to 0 otherwise. We assume that non-exporters face the same start-up costs : $C_i^X = C^X$.

The fact that the entry costs depends on the former firm's export status confers an inter-temporal character to the decision of exporting. Thus the firm compares the present value of exporting with the expenditures involved in the decision to enter foreign markets. That means that the firm will not only compare this additional profit at this period t (Π_{it}^X) with the entry costs (C^X), it will also take into account the variation in *future*

[7] Krugman (1980, p. 958) obtain a similar outcome, but the mechanisms is based on the size of home market (or demand), what he called the "home market" effect.

[8] If the firm i sells exclusively in domestic market, total profit would instead be: $\Pi_{it}^T = p_t^d \, Q_{it}^D - C_{it}^t$, where C^t = total cost of producing Q^D.

expected profit due to the fact that it exports now. Denote Π_{it}^{E} this expected profits.[9] The firm decides to export if current and expected revenues due to export compensate the start-up costs of exporting:

$$X_{i,t} = \begin{cases} 1 & \text{if } \Pi_{it}^{X} + \Pi_{it}^{E} > C^{X} \\ 0 & \text{otherwise} \end{cases} \tag{2}$$

The sunk costs model has been empirically tested for firms belonging to both developed and developing countries by, among others, Aw & Hwang (1995), Roberts & Tybout (1997), Clerides et al. (1998), Bernard & Wagner (1998), Bernard & Jensen (2004) and Girma et al. (2004). Roughly speaking, those authors aim at quantifying the impact of entry-exit costs on the probability of exporting (and some of them also test the presence of the learning-by-exporting phenomenon).

The empirical findings emphasise the relevance of the export experience to explain firms' ability to export, verifying the relevance of the sunk cost model to explain firms' export status.[10] There is a wide consensus as well concerning firms' characteristics that explained the export status: the size, the age, the capital ownership structure and the productivity performance are among the most significant factors.

Besides, Bernard & Jensen (2004, p. 569) conclude that the "key unanswered question is how firms obtain the characteristics that allow them to easily enter to the export market". We thus argue that one of those key elements to be taken into account is firms' access to the financial system in order to invest, to innovate, and to be able to incur sunk costs to enter foreign markets. We will then explicitly include some variables that represent firms' access to financing in this sunk-costs export decision model.[11]

Following this empirical literature, we will estimate the main determinants of firms' export decision using a non-linear binary-variable model. We will test which are the factors that affect the probability that a firm i export in a period t. An exporting firm gets additional receipts which depend on (macro-economic) exogenous factors like the

[9] Following Roberts & Tybout (1997), Π_{it}^{E} is equal to:

$$E_t \left(\sum_{j=t}^{\infty} \delta^{j-t} \Pi_{ij}^{X} | \Omega_{it} \right)$$

where δ is the discount factor and Ω_{it} is the firm specific information in period t. Π_{it}^{E} represents the discounted value of future earnings by selling in foreign markets.

[10] For instance, Bernard & Wagner (1998) find for German firms that being a current exporter increase by 50% the probability of exporting in the next period.

[11] This intuition is partly encouraged by the results of Wilson & Otsuki (2004)'s report, which is about the factors that foster business activities in developing countries. In a set of descriptive statistics, they find for Argentinean firms that market and other distribution costs are very important reasons preventing exports, as well as the difficulty faced by firms to obtain credits.

exchange rate and foreign demand conditions, and on firm specific characteristics like size, age, capital ownership structure and origin, productivity level, etc.

$$X_{i,t} = \begin{cases} 1 & \text{if } \beta\ Z_{it} \text{ - } (1 - X_{i,t-1})\ C^X + \mu_t + \epsilon_{it} > 0 \\ 0 & \text{otherwise} \end{cases} \tag{3}$$

where ϵ_{it} is the error term; Z_{it} is a vector that represents observable differences in firm-specific characteristics, which allow us to control for other sources of export persistence beyond sunk costs; and μ_t incorporates macro-economic shocks in export conditions (in our case, dummy years).[12]

Our objective is to test the importance of the sunk start-up costs for Argentinean firms. First, we estimate equation 3 where these costs are represented by the export experience variable (results are display in section 5.1). Second, we estimate the same equation but replacing the term $[(1 - X_{i,t-1})\ C^X]$ by *explicit* sunk costs variables (cf. section 5.2). The fact that our database is built up from a technological survey allows us to carry out this second set of estimations: it provides some questions about expenditures directly linked with firms' exporting decisions.

Since the purpose of the empirical work is to isolated sunk costs effects, we control for other firm-specific factors that could have an impact on the export persistence. The vector Z_{it} include thus the following variables: size, age, capital ownership origin, productivity level, firm's access to financial markets and three-digit ISIC code industry-dummies.[13]

Size and past productivity performance are usually understood as a sign of a firm success, and successful firms are more likely to export. Besides, the size can indirectly impact on export ability since larger firms usually take advantage of an easier access to financial markets, that would help firms to finance investment, innovations activities and, obviously, entry costs. In the same vein, following Rajan & Zingales (1998) and Fanelli & Keifman (2002), one could expect that older firms are more likely to export, therefore we include firms' age as an explanatory variable.

Likewise, being part of a conglomerate and/or belonging to foreign capital are commonly view as an asset to participate in foreign markets (Bernard & Jensen 2004, Bernard & Wagner 1998). This is particularly true for the firms that belong to a multinational company, since not only these firms benefit from a closer link with agents settled abroad,

[12]We do not include a firm-specific (time-invariant) factor in the error term since the time-dimension of our database is rather restricted. See section 4.1 for further details about the sample.

[13]We collapse industry sector in five groups to avoid a list of independent variables excessively long (food and tobacco; textile and leather; paper, wood and furniture; chemicals, metals and minerals; and machinery, capital goods and transport equipment). Results remain unchanged.

but they also usually benefit from an intra-firm flow of trade. Moreover, multinational firms have an easier access to international financial markets.

Beyond verifying the presence of sunk costs, we aim at assessing the role of the access to financial system on exports capacity we add financial variables to the equation. As mentioned before, the fact of becoming an exporter implies large expenditures in the previous period, not only to finance the sunk costs to enter but, even before, to invest in physical and human capital (as well as in R&D) in order to improve the productivity performance. This is a previous condition to be able to gain domestic-market shares, increase and save profits and thus to afford the start-up costs to export later on.

3.2 Methodological Issues

Estimates of dichotomic dependent variables require non-linear models—i.e. probit and logit models, depending on whether the cumulative function follows a normal or a logistic distribution. Although this function distribution must be assumed because it is not observable, Maddala (1983, p. 23) points out that the cumulative normal and logistic distributions are quite similar and thus results from both models are likely to be very close.[14]

We verify whether we have to deal with heteroskedasticity and influential cases problems, which would provide inconsistent estimators. We use a set of tests to assess the model's goodness of fit: we verify the joint significance of the variables, as well as whether all variables are orthogonal to each other.

Besides, there are some controversies about the causal link among export experience and some firms' characteristics, like size or productivity (as we noted in section 2), as well as about the potential simultaneity in the determination of exports decision and firms features (like their size or employment composition). In order to deal with those problems, firm-specific variables are lagged one period, as it is usually done in the empirical literature.

There are unobservable firm characteristics that can have an impact on export capacity and they are in general quite permanent over the time (at least for relatively short periods as in our case). This unobserved heterogeneity can be dealt with using fixed or random effect models. We acknowledge that some unobserved firm-specific characteristics are likely to be correlated with the explanatory variables, which would prone a fixed effect estimation strategy. Nevertheless, this approach would miss interesting information represented in some dummy variables (like foreign, financial restriction and explicit sunk cost variables) and, in any case, probit models can be estimated assuming random

[14] Actually, probit and logit models estimated in the following section furnish similar results and the predicted probabilities provided by both models are highly correlated (0.99 at 1% of significance).

effect specification but do not allow to use fixed effect estimators, particularly with large cross-sectional units (Green 2003, p. 897), as it is our case. Since in our particular sample the time-series dimension is less present, unobserved heterogeneity is not likely to affect much the regressors' properties, though.

4 Database and descriptive statistics

4.1 The Data

We use a firm-level database of about 1600 Argentinean industrial firms for the years 1992, 1996, 1998 and 2001, extracted from the two National Surveys of the Technological Behaviour of Argentinean Industrial Firms (*ECT: Encuesta Nacional sobre la Conducta Tecnológica de las Empresas Industriales Argentinas*).[15] The sample is relatively representative of aggregate Argentinean manufacturing firms: it concentrates approximately 30% of the manufacture gross product value (GPV), as well as 40% of aggregate manufactured exports and 30% of the industrial labour force.

The first survey contains data from 1639 firms for the years 1992 and 1996, while the second survey provides information on 1668 firms for 1998 and 2001. Since we used lagged variables, we need to work with firms that are present in several periods and thus we just keep those firms that are present with positive sales in both surveys. The sample is then reduced to 799 firms for the four years. From these 799 firms, about one third have never exported and between 40% and 56% do not export each year. The exporting behaviour is markedly persistent: 88% of the firms who exported in the previous year do it again in the current period (for 1998 and 2001), and equally, 87% of firms that do not export will not do it in the following period.

The survey is naturally biased towards the best performance firms since only surviving firms are interviewed. Furthermore, as we work with firms that are in operation along the whole period, we restrict even more our sample in the same sense. We acknowledge that this can reduce the representativeness of the Argentinean population firms, though its macro-economic weight is high enough to teach valuable lessons about firms export behaviour in Argentina. Moreover, firms that exit the market are less likely to be exporters and more likely to face financial restrictions, which would probably strengthen our empirical results.

The data are expressed in real terms. They are deflated, depending on the case, by

[15] This survey has been carried out by the National Bureau of Statistics (INDEC), the Secretary for Science and Technology, the Institute for Social Studies of Science (IEC) of Quilmes University, and the Institute of Industry (IDEI) of the General Sarmiento National University. It is worth noting that it is a *firm*-level and not *plant*-level survey, thus we do not have double-accounting problems.

the Argentine wholesale price index (IPP), by the imported price index (differenciated by imported capital goods and imported inputs) and by a sectoral price index built from the evolution of the producer price indices (IPIM). All those index are published by the National Bureau of Statistics (INDEC-Ministry of Finance).

A list of variables' definition can be found in table 2 in the appendix and further details on the specific surveys' question, used to build financial variables and explicit sunk costs variables, are given in table 3. The questions used to create both these two sets of variables are available *only* for the 1992–1996 survey *or* the 1998–2001 survey, but never for both (excepting $BkFin$). Note that answers account for the whole period covered by each survey and not for every year separately —ie. *one* figure for the four-year period or three-year period, depending on the survey).

Financial factors are represented by two variables. The first variable ($FinPb_{98-01}$) reports whether the firm was inhibited to innovate, during the period 1998–2001, because of financial restrictions. Given that the surveys do not provide a question about financial constraint to invest in a broadly sense, we use this answer as a proxy for financial problems.[16] We include an additional financial variable that measures the proportion of innovation carried between 1992–1996 that is financed by the banking system ($BkFin_{92-96}$).

In the second set of regressions we add three dummy variables that *explicitly* assess the sunk costs to export: $TrainExpo_{92-96}$ equals one whenever one main firm's objective to carry out labour training, between 1992 and 1996, is related to export activity; $InnExpo_{92-96}$ assesses the fact that product's adaptation to foreign markets is one of the main motivation to innovate during the period 1992–1996; and $EnvirExpo_{98-01}$ tells that the firm carried out environment-friendly activities, during the years 1998 to 2001, because foreign markets required it.

We exclude the years 1992 and 1996 from the time dimension of the estimations (equations 4 and 5, section 5), since the variable representing financial restrictions only appears in the second survey. Nevertheless, we include information of the first survey through the set of lagged variables. Although we miss a part of the observations, we decided to work just with 1998 and 2001 in order to shorter time periods—i.e. 2 and 3 years, instead of 4 as it would have been the case if we had added 1996 to the estimations. Moreover, since we include export experience –i.e. export status lagged from one period— we would not take into account 1992 anyway and, in an additional specification of the estimated equation, we also incorporate the second lag of the dummy-exporting variable, leaving aside 1996 as well.

[16] Although we acknowledge the limitations of this variable, we argue that it nonetheless includes interesting information. Actually, *financial restrictions to innovate* is chosen as one of the main reasons preventing innovation (among other 11 alternative choices).

4.2 Descriptive statistics

First of all, we can observe in figure 1 the size and age distribution of firms, split up by export status—i.e. exporters and non-exporters. The figures show that exporters are likely to be larger (left hand-side figures) and older (right hand-side figures) than non-exporters.

Table 4 reports information about the distribution of sales and exports. Taking sales distribution as a benchmark, we observe that not only exports are more concentrated than sales on the top centiles, but also the level of concentration increases over the time. The first centile explains 35–39% of total exports in the first half of the decade and 52–54% in the second half (compared with 23–25% and 27–28% respectively for the sales distribution). Besides, 3% of the firms represent 58–61% of foreign market participation between 1992–1996 and more than 73% in 2001.

With respect to productivity performance, as expected, exporting firms displays higher productivity level than non-exporters (cf. table 5). Similarly, this table reports higher productivity for large firms and lower for small ones. Note that for small firms the level is markedly lower than for the ones that do not export, and for large firms productivity is by far higher than for exporters. The second part of the table displays the productivity *gains* by exporting status. Unexpectedly, there does not seem to be any difference in productivity gains between exporters and non-exporters, whereas there are clear differences between large firms on the one side, and small and median firms on the other (suggesting a divergence rather than a catching-up process among firms' productivity).

Finally, we look at a set of financial variables related to export and size status. First, table 6 displays the weighted percentage of firms that face financial problems to innovate among different export status. Exporters benefit from a higher access to the bank system and face less financial restrictions: among those firms which have high bank finance, 61% are exporters whereas less than 30% of the firms that find financial limitations are exporting. Secondly, the same shares computed by firms' size reveal that, as expected, smaller firms face higher financial limitations (representing more than 50%). Surprisingly, the share of high bank access is similar for big and medium-size firms, while lower for small ones.

5 Econometric Results

5.1 Traditional Sunk Costs Empirical Model

We will estimate the following specification of equation 3:

$$\begin{aligned}\text{proba}[X_{i,t}=1] = {} & \beta_1 X_{i,t-1} + \beta_2 Size_{i,t-1} + \beta_3 Age_{i,t-1} + \beta_4 ForeignK_i \\ & + \beta_5 Prody_{i,t-1} + \beta_6 FinPb_{i,98-01} + \beta_7 BkFin_{i,92-96} \\ & + \beta_8 DuSect_i + \beta_9 DuYear_t + \epsilon_{it}\end{aligned} \tag{4}$$

i=1...799, t = 1998 and 2001 and ϵ_{it} is a noise.

Table 7 summarises the outcome of the probit model estimations.[17] The first column displays the baseline model without including financial variables, while the second column does it. First of all, we confirm the significant impact of export experience on the probability of entering foreign markets (X_{t-1}) since having exported in the previous period increases the standardised probit index by 2.1 of a standard deviation (*ceteris paribus*). Analysing the coefficients of probit estimations is not straightforward, thus we estimate the marginal effects of regressors (third column).[18] For example, the fact that the firm participated in foreign markets in the last period increases the probability of exporting in the current year by 0.70 percentage point.

Then, as expected, the size, the productivity performance and the fact of having foreign capital participation, all increase the probability of entering export markets (and they are significant at 1%), while the age does not seem to have an impact on this probability (although it always has a positive coefficient). It is interesting to note that adding financial factors is likely to affect firms' foreign market participation, without changing the previous results. Facing financial restrictions have a negative impact on export decision (and significant at 1%), while the level of bank access, though positive, is not statistically significant. The last column displays the results of a random effect probit estimation. All the coefficients tend to be similar to the previous probit estimation.[19]

The estimations thus far follow equation 4, but we add some explicative variables which results are displayed in table 8. Firstly, we include a dummy variable for the firms not belonging to a conglomerate (*Independent*) and we confirm this is not a factor that prompts firms' export decision. Secondly, and following previous empirical work in this field, we add a second lag of export experience (X_{t-2}), in order to test whether there is an export persistence phenomenon. We verify that, although the coefficient is positive and

[17] We control using sectoral and time dummy variables, but we do not include the result on tables to make them easily readable.

[18] The marginal effects compute the impact on the probability that the firm export (X_t=1) of a one percentage increase in the independent variable (or in the case of dummy variables, the change from 0 to 1), evaluated at the means of all the rest of the variables.

[19] One explanation could be that since we take two years in the regressions, the correlation between the unobserved heterogeneity and the regressors is likely to be reduced. This goes along with the highly limited time-series dimension in the estimations, mentioned in section 3.2.

significant, it is lower than the one lagged variables which means the impact declines over time but it lasts some periods. It is worth noting that in our sample the second lag of exports represents five or six years before, which means that the depreciation of the past experience over time is not so high, and six years later it still matters to enter foreign markets. We check as well the impact of having exported in the first year of the sample (X_{1992}), independently on whether the firm exported later on. This coefficient is positive, significant and relatively high, suggesting that exporting firms before the nineties are rather settled exporters.

Finally, we include an alternative variant of export experience —as proposed by Clerides et al. (1998, p. 927)— which is measured by the weight of export on firms' sales ($ExpoIntensity$) instead of a dummy variable representing whether the firm have exported. It is interesting to note that, all coefficients are larger and the age and the access to bank finance, now become statistically significant variables.

The results so far are in agreement with the existing sunk costs empirical work: a significant and positive coefficient for previous exporting experience on export decisions suggests the presence of sunk costs.

. We could thus conclude that significant and positive coefficient for previous exporting experience on export decision suggests the presence of sunk costs. Despite the wide acceptance of this empirical strategy, it is worth noting that it holds under a not necessarily valid hypothesis: the sunk start-up costs have been properly isolated, by controlling from any alternative reason of persistence in exporting activity (included in vector Z_{it}). In order to deal with this potential drawback, we will replace the dummy variable representing foreign market participation by a set of three variables that *directly* imply that the firm incurred sunk costs to sell abroad. Results are presented in the next subsection.

5.2 Explicit Sunk Costs Empirical Model

Following the estimated equation 4, we replace $X_{i,t-1}$ by three variables that explicitly represent sunk start-up cost to export: (i) improve the labour force skill in order to export ($TrainExpo_{i,92-96}$); (ii) carry out innovation activities with the same exporting incentive ($InnExpo_{i,92-96}$); and (iii) implement environment-friendly policies requested by foreign markets ($EnvirExpo_{i,98-01}$). These variables constitute a more accurate proxy of sunk costs than past export experience, because they allow to estimate the impact of specific previous expenditures related to foreign markets on the probability of exporting in the future.[20]

[20]We verify that not only confirmed exporters incur these costs. Actually, among firms that carry out this type of investment , between 12–40% are non-exporters (depending on the year and on the variable).

The first two coefficients in the following equation (β_{1a} and β_{1b}) represent the impact of costs the firm incurred between *1992 and 1996* on the probability of exporting in *1998 and 2001*. The interpretation of the third variable's coefficient ($beta_{1c}$) is less straightforward since expenditures not necessarily precede export decisions, particularly for the year 1998. In any case, the estimation of the equation 5 only for t equal to 2001 yielded similar results (cf. the second column of table 10).

$$\begin{aligned}\text{proba}[X_{i,t}=1] = {} & \beta_{1a}\, TrainExpo_{i,92-96} + \beta_{1b}\, InnExpo_{i,92-96} + \beta_{1c}\, EnvirExpo_{i,98-01} \\ & + \beta_2\, Size_{i,t-1} + \beta_3\, Age_{i,t-1} + \beta_4\, ForeignK_i + \beta_5\, Prody_{i,t-1} \\ & + \beta_6\, FinPb_{i,98-01} + \beta_7\, BkFin_{i,92-96} + \beta_8\, DuSect_{i,t} \\ & + \beta_9\, DuYear + \epsilon_{it}\end{aligned} \tag{5}$$

i=1...799, t = 1998 and 2001 and ϵ_{it} is a noise.

The coefficients of this new specification are displayed in table 9 and they provide very interesting outcomes. We include the probit estimation of the previous subsection (in the first column) to make easier the comparison with estimated regressors from equation 5. As done before, we display the probit outcome and its marginal effects (second and third columns). The overall picture shows that not only the three sunk cost variables are highly significant to explain export decision, but also that the rest of explanatory variables are highly significant as well (with greater coefficient values in all cases, except $FinPb_{98-01}$ for which the coefficient is slightly lower). In the forth and the fifth columns we include the logit estimation and its odds ratio respectively, which confirm the similarity of probit and logit models (regressors usually differ by a factor of about 1.7 among them) and allow us to interpret the coefficients in a more straightforward way. For instance, training the labour force in order to export increases the odds ratio of exporting by a factor of 3.1 (holding constant the remaining variables), while facing financial problems reduces the odds ratio of exporting by a factor of 0.54 (holding constant the rest of the variables).

We control for heteroskedasticity, but there is no sign of very large residuals (see figure 2). In any case, in order to verify that there are not influential observations (that could biased our results), we estimate the same model removing those firms, we run robust estimations as well, and again coefficients remain unchanged. Finally, we compute the collinearity diagnosis to check whether all the variables are orthogonal to each other and we have confirmation of non collinearity, which excludes one source of estimation's unsoundness. Likewise, the Wald test for joint significance for all the variables is rejected

at 1%, thus all the variables all simultaneously significant.[21]

The fact that the size and productivity performance are continuous variables allows us to calculate the predicted probability of being exporter based on the parameters issued from the model estimation. As we can see in figure 3, there is a positive relation between firms' size, as well as productivity level, and their ability of exporting, all the rest of the variables computed at their mean values (in the figure, dash lines represent the upper and lower limits of the confidence interval of the predicted probabilities). It is worth noting that the confident intervals differs between the two variables, been larger for non-extreme values of productivity performance. Besides, the positive relation between the productivity level and the probability of exporting fade away when productivity level reaches a certain threshold, suggesting that after a certain point productivity gains do not necessarily improve export capacity.[22]

In order to test the relevance of certain firm characteristics we compute the predicted probability of exporting depending on whether the firm belongs to one of the two types of *ideal* firms we define (see table 11). Firms without financial problems and with foreign capital participation are likely to export in the current year with a probability of 81% (at 95% confidence level), while firms that show the opposite characteristic the probability diminishes to 41%. Even more overwhelming, for those firms that incur in the aforementioned explicit sunk start-up costs, the probability of exporting become 99% and 34% for the opposite group. To use as a benchmark, the probability of exporting for an average firm is 57%.

Finally, to provide a check on the robustness of the results, we estimate equation 5 under alternative samples and variables' definition (table 10).[23] First, to confirm that sunk costs are incurred before export decisions, we reduce the time dimension to the last year of the survey (2001). Results (second column of the table) are relatively unchanged although the coefficient are slightly lower—and the coefficient became non statistically significant for ($BkFin_{92-96}$). Note that keeping only this year (2001) not only reduces the number of observations, but leaves further in time the variables that correspond to the first survey (period 1992-1996).

Second, we replace $Size$ by $Size^{sl}$ (firms' size determined by total sales instead of total labour force) and the estimates are again practically unchanged (third column). The exception is the coefficient of productivity, which is no longer statistically significant.

[21]The same set of tests were run for regressions of the previous subsection and they confirm the estimation's goodness-of-fit as well. In the sake of simplicity, we do not include them in the appendix.

[22]This goes along with Melitz (2003) results: once a firm belongs to the most productive group, it is already able to enter foreign markets while less productive firms still need gains in productivity to be able to do so.

[23]Like in the previous table, we include in the first column the probit baseline estimation of the equation 5 as a benchmark.

$Size^{sl}$ and $Prody$ are stronger correlated, probably due to the fact that both variables are based on total sales. Third, we redefine export status ($X^{x/s}$): exporters are firms selling to foreign markets over 5% of total sales (forth column). Most of the coefficients remain stable, excepting for Age, which became inexplicably negative, though significant only at 10% and $BkFin_{92-96}$ that turn non significant. However, this last estimation should be read with caution because, although the ratio exported—5% over total sales—is not so high, it is high enough to leave aside a large proportion of exporters. Actually, more than 42% of exporting firms displays a ratio inferior to 5% for the years of the estimations. This can under-biased the coefficient comparing to the original definition of exporters: firms exporting a larger part of its production are more likely to be confirmed exporters and thus less dependent of the access to financial system.

6 Conclusion

This paper investigates the export behaviour of Argentinean firms during the 1990s. Using a four-period sample of 799 firms, we assess the impact of sunk costs and firm-specific characteristics —particularly access to finance— on the decision to participate in foreign markets. We estimate a binary-choice variable model using different specifications to tackle the issue.

The overall picture is that prior export experience plays a key role in firm's present export capacity, suggesting the presence of sunk costs to enter foreign markets. In addition, some particular firm-specific characteristics—like size, capital ownership, productivity level and a *reduced financial access*— are likely to increase the probability of exporting. It is worth noting that our results are robust and hold using alternative econometric techniques as well as variables specifications, and they perform well under the associated tests.

Two novel elements of our empirical results deserve particular attention. First, our analysis of the sunk start-up costs hypothesis go further than what is commonly done in the literature, given that we include a set of variables that *explicitly* represents firms' required costs to participate in foreign markets: improving the skill of their labour force in order to export; carrying out innovation activities in order to export; and implementing environment-friendly policies requested by foreign markets. Although these variables are not a proxy that exhaustively measure sunk costs, they constitute an alternative specification which provides a new way to test the hysteresis hypothesis.

Second, we want to underline some interesting findings about the role that *financial development* has on firms' success in exporting, through a direct and an indirect channels. On the one hand, our empirical work suggests that firms' access to financial markets

and not facing financial restrictions to innovate have a direct—and positive—impact on export decisions. On the other hand, there is a vast literature that proves the negative relation between the size and the access to the financial system for a firm—i.e. small and medium firms are more financially constrained than bigger ones. Since size is statistically significant to explain firms' export decisions, it constitutes the indirect channels, reinforcing the impact that weak financial systems can have on export performance. This confirms the idea, already mentioned in the introduction, that a weak financial system can jeopardise the non-price competitiveness of a country.

Some of the microeconomic mechanisms emphasised so far become even more relevant if we consider their macro-economic scope. For instance, in the presence of export sunk costs, a currency appreciation can have negative and long lasting effects on a country's productive structure and trade pattern. Therefore, export supply can remain permanently damaged because the following phase do not allow to completely recover export capacity lost during the appreciation phase.

It goes without saying that this micro-macro interactions analysis as well as our empirical work deserve further research. Particularly, it would be interesting to investigate more in details the alternative channels linking the access to the financial system with international trade, for instance through the role that investments in technology has on firms' export capacity – expenditures that can be viewed as sunk costs (Becker & Greenberg 2005). Besides, in Argentina, firms' responded quite differently to the recent liberalised environment of the nineties, and Katz & Kosacoff (1998) and Kosacoff (2000) identified two kinds of reaction: "offensive restructuration" and "defensive strategies" depending on which was the firm's technological response to cope with this new environment. In future extensions, we aim at testing the scope of those opposite behaviours using the ECT database. Finally, we are also interested in further analysing firms' export decision, focusing on the key elements that allow firms not only to enter foreign markets but rather to *keep on* exporting once they have entered them.

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7 Appendix: Tables and Figures[24]

Table 1: Export Concentration in 1998 (million USD and percentage)

	Accumulated value of exports (million USD)	Share of total exports (%)
Top 5	4,977	20.0
Top 10	7,535	30.3
Top 20	11,004	44.4
Top 50	15,686	63.2
Top 100	18,202	73.4
Top 500	23,509	94.8
Bottom 100	45	0.02
Bottom 500	1,285	5.2

Source: Fanelli & Keifman (2002, p. 39), data from Revista Mercado.

[24] All figures and tables are authors' calculation based on ECT database (except table 1).

Table 2: Variables

Name	Definition
X_t	Dummy=1 if exports>0 in t
$X_t^{x/s}$	Dummy=1 if exports/sales > 5% in t
X_{t-1}	Dummy=1 if exports>0 in t-1
X_{t-2}	Dummy=1 if exports=0 in t-1 *and* exports>0 in t-2
Y_i 1992	Dummy=1 if exports>0 in 1992
$Size$	Ln [Total Labour]
$Size^{sl}$	Ln [Total Sales]
Age	Ln [Years elapsed after firm creation]
$ForeignK$	Dummy variable=1 if the firm has foreign capital participation
$Independent$	Dummy variable=1 if the firm does not belong to a conglomerate
$Prody$	Output per worker (pesos/worker)
$FinPb_{98-01}$	Dummy=1 if the firm does not invest because of financial restrictions, which is 1 among a maximum of 4 reasons a firm have chosen over 11 possibilities
$BkFin_{92-96}$	Proportion of bank over total finance for innovation (%)
$TrainExpo_{92-96}$	Dummy=1 if firm's main motivation to training labour force is to export the firm have to choose 3 motivation among 11 alternatives choices
$InnExpo_{92-96}$	Dummy=1 if firm's main objective to innovation is products' adaptation to foreign markets the firm have to choose 3 motivation among 15 alternatives choices
$EnvirExpo_{98-01}$	Dummy=1 if one of the main reason to carry environment-friendly activities is a requirement from foreign markets we keep those firms that have chosen a maximum of 5 reasons among 11 alternatives choices
$ExpoIntensity$	Ln [Total Exports/ Total Sales +1]
$DuSect$	Three-digit ISIC code industry-dummy variables
$DuYear$	Dummy-year variables

Table 3: Questions of the ECT surveys

Variable	Question
Financial Variables	
$FinPb_{98-01}$ (ECT 1998-2001)	Indicate whether the absence of innovation is due to: 11 choices of "yes" or "no", among which one of the alternative answers is: Financial resources restrictions *This question must be answered only if the firm does not carry out any innovation during the period 1998-2001.*
$BkFin$ (ECT 1992-1996 & ECT 1998-2001)	Distribute the source of finance used to innovate (the sum must be 100%): Long list including retained earnings, bank system, governmental institutions, suppliers, clients, etc.
Sunk Costs Variables	
$TrainExport_{92-96}$ (ECT 1992-1996)	Indicate the 3 main motivations to implement training activities: List of 11 choices among which one is: to start-up/increase exports. *This question is answered if the firm carry out labour force training activities.*
$InnExpo_{92-96}$ (ECT 1992-1996)	Indicate the 3 main purposes of innovation: List of 15 objectives, among which one is: Product modification for foreign markets requirements.
$EnvirExpo_{98-01}$ (ECT 1998-2001)	Indicate the main motivations to develop environment-friendly activities: List of 11 categories, among which: requirement of foreign markets.

Table 4: Export and Sales Distribution (percentage of exports or sales over total)

Centiles	Exports			
	1992	1996	1998	2001
100	39.3	34.6	51.9	54.1
99-100	52.2	49.9	63.6	67.1
98-100	60.6	57.8	68.6	73.5
91-100	80.8	79.6	85.6	87.3
76-100	94.1	93.9	95.0	95.9
51-100	99.0	98.9	98.9	99.2
Centiles	Sales			
	1992	1996	1998	2001
100	24.9	23.0	27.4	28.4
99-100	36.0	35.0	41.2	42.2
98-100	43.6	42.8	49.1	50.2
91-100	67.3	68.3	70.7	72.9
76-100	84.4	84.4	84.4	84.4
51-100	95.0	95.6	96.0	96.9

Figure 1: Size and Age distribution by Export Status

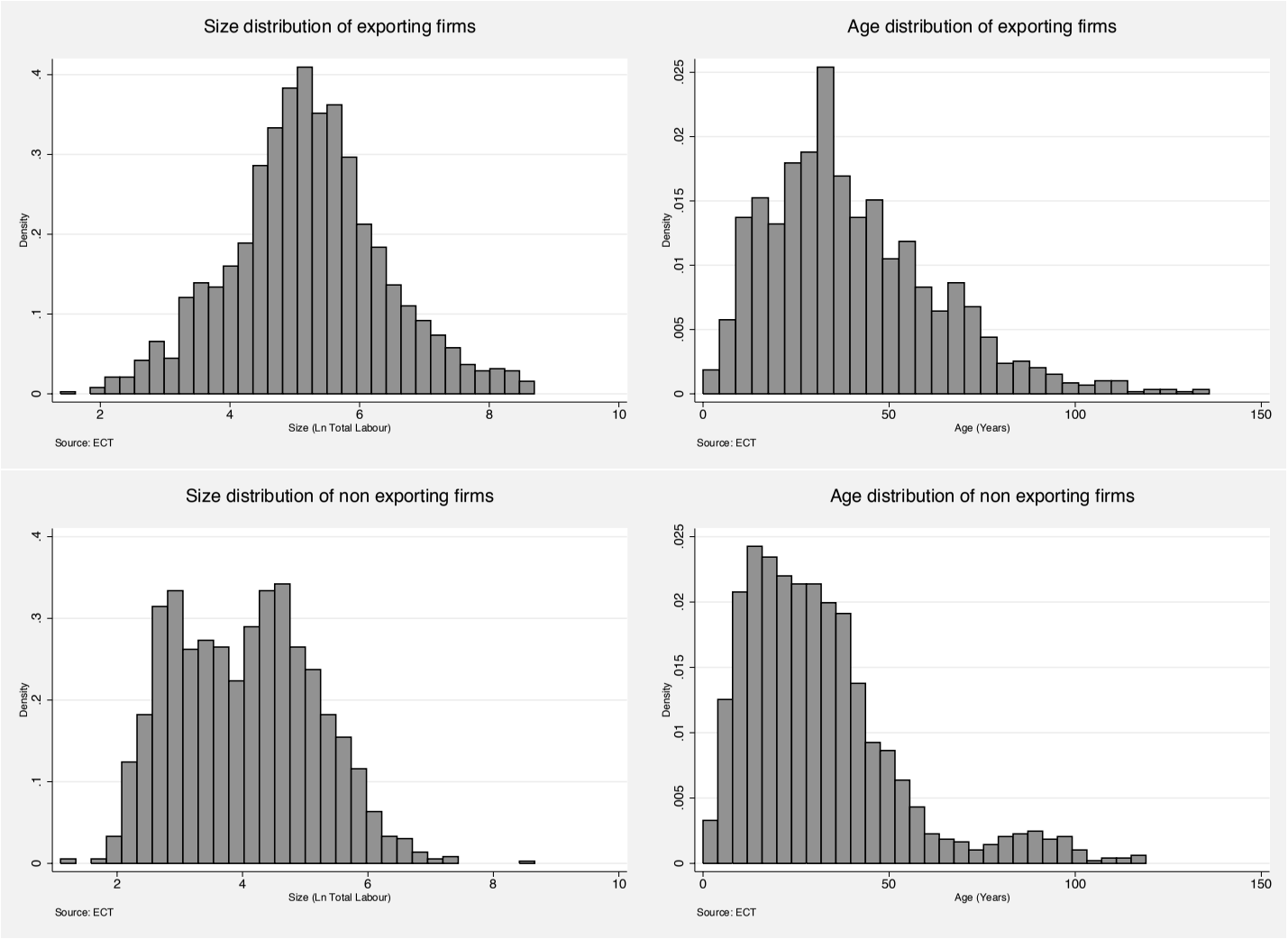


Table 5: Productivity Performance by Export Status 1992-2001 (thousand of $/worker)

	Productivity Level		
Export Status	mean	median	Sd Deviation
Non-Export	85,734	55,187	121,943
Export	137,090	88,576	219,203
Size			
Large	201,337	132,423	289,659
Median	106,716	79,767	101,606
Small	59,828	45,214	55,209
Total	113,038	72,150	181,293

	Productivity Gains		
Export Status	mean	median	Sd Deviation
Non-Export	0.155	0	1.616
Export	0.153	0	0.799
Size			
Big	0.284	.002	1.041
Median	0.104	0	0.596
Small	0.096	0	1.552
Total	0.154	0	1.254

Size partition is based on firms' total sales, following the criteria used by the Ministry of Finance for the *Censo Económico* de 1993 : sales of *small* firms are inferior to $7.5 millions, *big* firms have sales higher than $18 millions, and sales for *median* firms are between those two limits.

Table 6: Financial Problems by Export Status and by Size 1998-2001(percentage)

Export Status	Financial Problems (1998-2001)	High Bank Finance (1992-1996)
Export	28.7	60.6
Non-Export	71.3	39.4
Total	100	100

Size	Financial Problems (1998-2001)	High Bank Finance (1992-1996)
Big	17.1	33.1
Median	27.2	35.6
Small	55.7	21.2
Total	100	100

Size partition is based on firms' total sales, following the criteria used by the Ministry of Finance for the *Censo Económico* de 1993 : sales of *small* firms are inferior to $7.5 millions, *big* firms have sales higher than $18 millions, and sales of *median* firms are between those two limits.
High Bank Finance is a dummy variable equal to 1 for those firms in the top three deciles of firms that finance innovations with bank funds.

Table 7: Sunk Costs Baseline Model. Estimations of Equation (2)
Dependent variable: Probability firms export in t (X_t=1)

	BaseModel	Fin.Var.	Mg Effects	Probit RE
X_{t-1}	2.123***	2.110***	0.709***	2.110***
	(0.104)	(0.105)	(0.103)	(0.103)
$Size_{t-1}$	0.169***	0.149***	005***	0.149***
	(0.039)	(0.039)	(0.015)	(0.043)
Age	0.027	0.048	0.019	0.048
	(0.079)	(0.079)	(0.031)	(0.083)
$ForeignK$	0.585***	0.511***	0.193***	0.511***
	(0.149)	(0.149)	(0.052)	(0.159)
$Prody_{t-1}$	0.001***	0.001***	0.001***	0.001***
	(0.0004)	(0.0004)	(0.0004)	(0.0005)
$FinPb_{98-01}$		-0.401***	-0.159***	-0.401***
		(0.109)	(0.043)	(0.113)
$BkFin_{92-96}$		0.002	0.001	0.002
		(0.002)	(0.001)	(0.002)
cons	-2.183***	-1.935***	-1.935***	-1.935***
	(0.331)	(0.322)	(0.322)	(0.338)
Observations	1284	1284	1284	1284
Pseudo R-sq	0.493	0.501		
Joint Significance	593.184***	590.498***	590.498***	589.376***

Note: Standard errors appear in parentheses. ***: Significant at 1%. **: Significant at 5%. *: Significant at 10%.

Table 8: Probit Estimations: Sunk Costs Model with Additional Variables
Dependent variable: Probability firms export in t (X_t=1)

	$Independent$	X_{t-2}	X_{1992}	$ExpoIntensity$
X_{t-1}	2.107***	2.199***	1.917***	
	(0.106)	(0.115)	(0.114)	
$Size_{t-1}$	0.152***	0.137***	0.13***	0.292***
	(0.04)	(0.039)	(0.04)	(0.04)
Age	0.047	0.044	0.017	0.225***
	(0.08)	(0.079)	(0.08)	(0.073)
$ForeignK$	0.46***	0.503***	0.426***	0.679***
	(0.154)	(0.149)	(0.153)	(0.143)
$Prody_{t-1}$	0.001***	0.001***	0.001***	0.002***
	(0.0004)	(0.0004)	(0.0003)	(0.0005)
$FinPb_{98-01}$	-.397***	-.407***	-.419***	-.403***
	(0.111)	(0.11)	(0.11)	(0.101)
$BkFin_{92-96}$	0.002	0.002	0.002	0.004**
	(0.002)	(0.002)	(0.002)	(0.002)
$Independent$	-.035			
	(0.123)			
X_{t-2}		0.392**		
		(0.176)		
X_{1992}			0.45***	
			(0.109)	
$ExpoIntensity_{t-1}$				6.994***
				(1.227)
cons	-1.929***	-1.964***	-1.748***	-2.654***
	(0.345)	(0.323)	(0.325)	(0.323)
Observations	1234	1284	1284	1284
Pseudo R-sq	0.498	0.504	0.51	0.347
Joint Significance	573.066***	586.35***	579.93***	242.325***

Note: Standard errors appear in parentheses. ***: Significant at 1%. **: Significant at 5%. *: Significant at 10%.

Table 9: Sunk Costs Explicit Variables. Probit Estimations of Equation (3)
Dependent variable: Probability firms export in t (X_t=1)

	Du X_{t-1}	Probit	Mg Effects	Logit	Logit Odds
X_{t-1}	2.111***				
	(0.105)				
$TrainExport_{92-96}$		0.721***	0.254***	1.147***	3.148***
		(0.171)	(0.050)	(0.285)	(0.896)
$InnExpo_{92-96}$		0.658***	0.237***	1.067***	2.907***
		(0.145)	(0.045)	(0.242)	(0.702)
$EnvirExpo_{98-01}$		1.125***	0.352***	2.029***	7.606***
		(0.27)	(0.27)	(0.502)	(3.822)
$Size_{t-1}$	0.15***	0.326***	0.129***	0.562***	1.753***
	(0.039)	(0.038)	(0.015)	(0.068)	(0.119)
Age	0.048	0.172**	0.068**	0.295**	1.344**
	(0.079)	(0.068)	(0.027)	(0.116)	(0.156)
$ForeignK$	0.511***	0.743***	0.268***	1.339***	3.816***
	(0.15)	(0.143)	(0.044)	(0.263)	(1.003)
$Prody_{t-1}$	0.001***	0.002***	0.0007***	0.003***	1.003***
	(0.0004)	(0.0005)	(0.0002)	(0.0009)	(0.0009)
$FinPb_{98-01}$	-.402***	-.394***	-.156***	-.626***	0.534***
	(0.109)	(0.094)	(0.037)	(0.159)	(0.085)
$BkFin_{92-96}$	0.002	0.003**	0.001**	0.006**	1.006**
	(0.002)	(0.0006)	(0.002)	(0.003)	(0.003)
cons	-1.933***	-2.483***		-4.348***	
	(0.322)	(0.304)		(0.532)	
Observations	1279	1279	1279	1279	1279
Pseudo R-sq	0.499	0.248	0.248	0.25	0.25
Joint Significance	588.137***	285.901***	285.901***	254.961***	254.961***

Note: Standard errors appear in parentheses. ***: Significant at 1%. **: Significant at 5%. *: Significant at 10%.

Table 10: Sunk Costs Explicit Variables. Probit Estimations of Equation (3). Dependent variable: Probability firms export in t (X_t=1), excepting for the last column ($X^{x/s}$=1)

	BaseModel	Only 2001	$Size^{sl}_{t-1}$	$X^{x/s}$
$TrainExport_{92-96}$	0.721***	0.66***	0.713***	0.796***
	(0.171)	(0.24)	(0.173)	(0.159)
$InnExpo_{92-96}$	0.658***	0.627***	0.598***	0.563***
	(0.145)	(0.207)	(0.143)	(0.129)
$EnvirExpo_{98-01}$	1.125***	1.250***	1.094***	0.786***
	(0.27)	(0.379)	(0.274)	(0.182)
$Size_{t-1}$	0.326***	0.269***		0.206***
	(0.038)	(0.05)		(0.037)
Age	0.172**	0.205**	0.159**	-.132*
	(0.068)	(0.101)	(0.069)	(0.07)
$ForeignK$	0.743***	0.939***	0.726***	0.463***
	(0.143)	(0.21)	(0.178)	(0.115)
$Prody_{t-1}$	0.002***	0.001**	-.0002	0.0008**
	(0.0005)	(0.0006)	(0.0005)	(0.0004)
$FinPb_{98-01}$	-.394***	-.444***	-.347***	-.220**
	(0.094)	(0.131)	(0.097)	(0.103)
$BkFin_{92-96}$	0.003**	0.003	0.003*	0.002
	(0.002)	(0.002)	(0.002)	(0.001)
$Size^{sl}_{t-1}$			0.324***	
			(0.067)	
cons	-2.483***	-2.351***	-5.919***	-1.640***
	(0.304)	(0.436)	(0.996)	(0.281)
Observations	1279	639	1279	1279
Pseudo R-sq	0.248	0.244	0.269	0.157
Joint Significance	285.901***	140.716***	253.67***	209.097***

Note: Standard errors appear in parentheses. ***: Significant at 1%. **: Significant at 5%. *: Significant at 10%.

Figure 2: Pearson Residuals by firms, based on the Sunk Costs Model Estimation

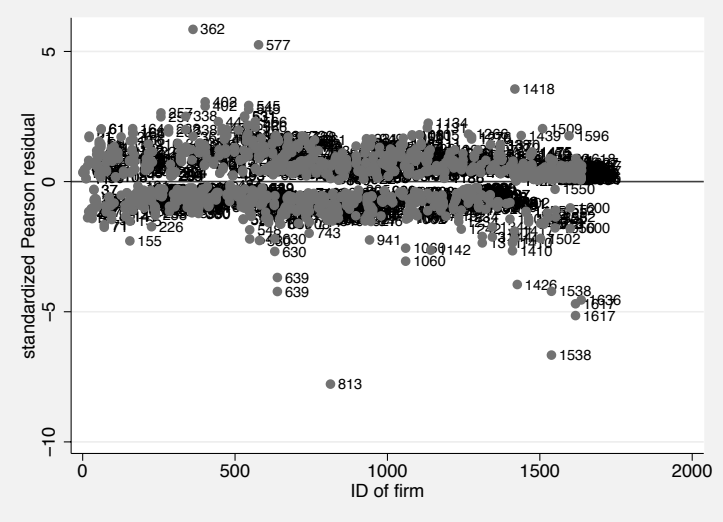
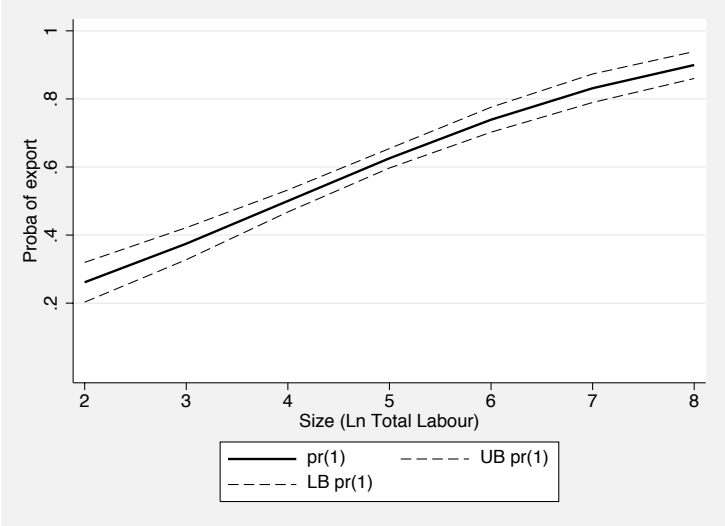


Table 11: Predicted Probabilities for *Ideal* Types of Firms

Types of firms	Predicted Probability of Exporting (95% CI)
No Financial Problem to Innovate Foreign	0.81[0.74, 0.89]
Financial Problem to Innovate No Foreign	0.41 [0.35, 0.48]
TrainExpo, InnExpo, EnvirExpo	0.99 [0.98, 1.00]
No TrainExpo, No InnExpo, No EnvirExpo	0.50 [0.46, 0.53]
Average firm	0.57 [0.54, 0.60]

Figure 3: Predicted Probability of Exporting

a) By size (Ln total labour).



b) By productivity ($/ worker).